

Appl. No. 10/799,895
Amdt. dated August 22, 2005
Amendment

PATENT

REMARKS/ARGUMENTS

This Amendment is responsive to the Office Action mailed on May 18, 2005. In this Amendment, claims 1-9 and 11 are canceled, claim 10 is amended, and claims 29-32 are added so that claims 10, 12-23, and 29-32 are pending and subject to examination.

Independent claim 10 is amended to incorporate the limitation in dependent claim 11 and dependent claim 11 is canceled. Accordingly, since independent claim 10 is the same as previously presented dependent claim 11, the amendment to claim 10 does not raise new issues requiring further consideration and/or search, since it was already searched and considered in the prior Office Action.

I. 35 USC 102(b) - Ishikawa et al.

Claims 1-10, 12-14, and 17 are rejected as being anticipated by Ishikawa et al. This rejection is traversed.

Claims 1-9 are canceled and claim 10 is amended to incorporate the limitation in dependent claim 11. Claim 11 was not rejected as being anticipated by Ishikawa et al. Therefore, claim 11 and other rejected claims depending from amended claim 10 are distinguished from Ishikawa et al. Withdrawal of the anticipation rejection is requested.

II. 35 USC 103 - Ishikawa et al., Takeda et al., and Tsui

Claims 11, 15, 16, and 18-23 are rejected as being obvious over Ishikawa et al., Takeda et al., and Tsui. According to the Examiner, Takeda et al. shows a carrier with bumps and shows bumps which are about the height of the semiconductor die and where the die may be at opposite sides of the carrier or the same side of the carrier as the bumps. The Examiner also states that, although Ishikawa et al. teaches that carriers may be used with logic circuits, the reference does not specifically describe a vertical MOSFET with a bottom drain. The Examiner states that "Tsui shows a vertical MOSFET structure where the bottom drain region would

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typically be connected to a metal carrier such as a heat sink (c. 4, l. 19)." The Examiner then concludes:

Thus it would be obvious to attach a vertical MOSFET device to a carrier with bumps where the drain region would be proximate to the die attach region of the carrier and the source and gate of the device would be distal to the die attach region of the carrier, as claimed.

Thus, all of the claimed features of the invention are taught by the combination of these references, and one skilled in the art would be motivated to combine the references so as to achieve better heat dissipation qualities.

This rejection is traversed.

- A. *One skilled in the art would not have been led to modify Ishikawa et al. with bumps about the height of a semiconductor die, where the bumps are on the same side of a carrier and on the opposite side of the carrier as allegedly disclosed in Takeda et al., and a vertical MOSFET as allegedly disclosed in Tsui to "achieve better heat dissipation qualities".*

The Examiner states that one would have been motivated to have modified Ishikawa et al. with bumps about the height of a semiconductor die, where the bumps are on the same side of a carrier and on the opposite side of the carrier as disclosed in Takeda et al. "to achieve better heat dissipation qualities". The metal projection bumps disclosed in Takeda et al. are used for electrical connections, and are not used to "achieve better heat dissipation qualities". In fact, Takeda et al. fails to mention that heat dissipation is of concern. Accordingly, contrary to the Examiner's allegation, one would not have used the bumps in Takeda et al. for "heat dissipation".

The Examiner also states that one would have been motivated to modify Ishikawa et al. to include a "vertical MOSFET device" as allegedly shown in Tsui "to achieve better heat dissipation qualities". This is simply incorrect. The heat dissipating element in Tsui is a "heat sink" and is not Tsui's vertical MOSFET. The addition of a "vertical MOSFET device" to Ishikawa et al.'s package would *generate* more heat, than the semiconductor device disclosed in

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Ishikawa et al., and would not "dissipate" heat as alleged by the Examiner. Accordingly, there is simply no motivation to modify Ishikawa et al. with a "vertical MOSFET", since doing so would generate more heat, not less heat as alleged by the Examiner.

In sum, obviousness has not been established, since there is no motivation to modify Ishikawa et al. with the teachings of Takeda et al. and/or Tsui "to achieve better heat dissipation qualities". The obviousness rejection should be withdrawn for this reason alone.

B. *The obviousness rejection improperly uses Applicant's own specification to find the motivation to combine the cited prior art.*

The obviousness rejection improperly used Applicant's own specification to identify the motivation used to combine the prior art. As explained by the MPEP § 2142, and the Court of Appeals for the Federal Circuit:

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and [must] not [be] based on applicant's disclosure. *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Here, neither Takeda et al. nor Tsui teach or suggest the use of bumps or a vertical MOSFET "to achieve better heat dissipation qualities". A computer search of Takeda et al. indicates that the word "heat" is not present in Takeda et al. Although "heat" is mentioned once at c. 4, l. 10 of Tsui, Tsui describes a "heat sink" that is used to remove heat from a MOSFET. Tsui does not state that his vertical MOSFET provides "better heat dissipation qualities". In fact, Tsui suggests exactly the opposite - that a vertical MOSFET "generates" heat and needs a heat sink to remove the heat.

Rather, the only place of record that mentions that stamped bumps help with heat dissipation is Applicant's own specification at page 6, line 31. In addition, the only place of record that teaches or suggests all claim limitations is Applicant's own specification. Obviousness has not been established, since it is clear that the motivation to combine and the

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combination of claim limitations improperly came from Applicant's own specification, and not the prior art.

- C. *Modifying the bumps in Ishikawa et al. so that they are arranged around a die attach region where a die is attached would render Ishikawa et al.'s package inoperative.*

Obviousness has not been established, since modifying the bumps in Ishikawa et al. so that they are arranged around a die attach region where a die is attached would render Ishikawa et al.'s package inoperative. If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Here, claim 11 recites a "plurality of bumps [that] are stamped bumps and [that] are arranged around the die attach region". If Ishikawa et al. has a die attach region at all, as shown in FIG. 10 and FIG. 11 of Ishikawa et al., the ends of the bumps 31D on the leads 11B would form the die attach region since the die 116B is attached to the bumps 31D. If one were to modify Ishikawa et al. to place the bumps 31D "around a die attach region where a die is attached" as in independent claim 11, the bumps 31D would be around the die and would not connect to the die 116B. In this case, there would be no electrical connection between the leads 11B and the die 116B. This would result in a non-functioning package. Accordingly, there is no motivation to modify Ishikawa et al. to arrive at the claimed invention.

III. Embodiments of the invention provide a number of advantages not appreciated by the prior art

Embodiments of the invention provide a number of advantages over the embodiments disclosed in Ishikawa et al., Takeda et al., and Tsui. Such advantages are mentioned at the carryover paragraph bridging pages 6-7 of the specification. Embodiments of the invention provide for the use of less solder, a better and more efficient manufacturing process, and superior thermal and electrical performance over conventional solder based systems. Applicant submits that even if obviousness can be established, the multiple advantages

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provided by embodiments of the invention would be sufficient to overcome any allegation of obviousness.

CONCLUSION

In view of the above arguments, Applicant submit that there are many more reasons why one would conclude that the present claims are allowable, rather than not allowable. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned.

Respectfully submitted,



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